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EXAMINER
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LEE, DAVID J

ART UNIT	PAPER NUMBER
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2613

SHORTENED STATUTORY PERIOD OF RESPONSE	NOTIFICATION DATE	DELIVERY MODE
3 MONTHS	02/12/2007	ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 02/12/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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**Office Action Summary**

Application No.

10/653,525

Applicant(s)

ISLAM, MOHAMMED N.

Examiner

David Lee

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 15 November 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) See Continuation Sheet is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,7-9,11,14,18,24,25,27,35,36,41,43,47-52,54-56,58-61,63-66,68-70,73 and 75-86 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

Continuation of Disposition of Claims: Claims pending in the application are 1,7-9,11,14,18,24,25,27,35,36,41,43,47-52,54-56,58-61,63-66,68-70,73 and 75-86.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 36, 41, 43, 47, 68, 73, 74, and 83-86 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs et al. (US Patent No. 5,005,167; hereinafter "Arthurs '167") in view Kurotori et al. (US Patent No. 6,333,803 B1).

Regarding claims 36 and 86, Arthurs '167 teaches an optical communication system, comprising: a first integrated module (12-1 and 22-1 of fig. 10) that generates a first output signal comprising a first optical signal wavelength ( $\lambda_1$ ), the first integrated module coupled to an optical distribution network (20 of fig. 10) comprising one or more optical splitters (star coupler 21 splits signal into 27-1 to 27-N; see also col. 4, lines 50-56), at least some of a first one or more of the optical splitters receive the first output signal and separate the first output signal into a plurality of first output optical signals (see col. 4, lines 50-56:  $\lambda_1$  of fig. 10 is split into a plurality of signals at  $\lambda_1$ ); a second integrated module (26-1 and 14-1 of fig. 10) that generates a second output signal comprising a second optical signal wavelength (along fiber 18-1 of fig. 10), the second integrated module and the second output signal coupled to the optical distribution network (coupled to network 20 of fig. 10) comprising the one or more optical splitters (star coupler 21 splits signal into 27-1 to 27-N; see also col. 4, lines 50-56), wherein the second integrated module receives at least one of the plurality of first output optical signals (receives

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signals along fiber 27-1 of fig. 10) and wherein at least the second integrated module comprises: an optical signal separator (26 of fig. 9) operable to separate the first optical signal wavelength from one or more optical signal wavelengths received by the second integrated module (see fig. 9: separator 26 separates the desired input signal from multiple wavelength signal along 27); one or more receivers (144 of fig. 9) operable to receive the first optical signal wavelength and to convert at least a portion of the first optical signal wavelength into an electrical signal (144 converts from optical to electrical); and one or more transmitters each operable to generate the second output optical signal coupled directly to the optical distribution network at the second optical signal wavelength and to modulate information onto the second output optical signal (148 of fig. 9), the controller operable to generate a control signal (via track 31 of fig. 9) based at least in part on a scheduling algorithm (see col. 5, lines 42-51) and to communicate the control signal to at least the first and second integrated modules (via track 31 of fig. 9), wherein the first and second integrated modules use the control signal to reduce contention within the optical communication system (see col. 5, lines 42-51; see also col. 10, lines 1-13). Arthurs '167 does not expressly disclose that at least one of the transmitters is a super-continuum light source. Kurotori, from a similar field of endeavor, teaches an optical communication system (see fig. 14) wherein the transmitters have super-continuum sources comprising an optical fiber and a length of optical fiber followed by one or more modulators capable of modulating information on an output from the super-continuum source (see Fig. 1 and Abstract). A skilled artisan would have been motivated to incorporate a super-continuum source into at least one of the transmitters of Arthurs '167 in order to decrease wavelength deterioration and variations and to increase system

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functionality. It would have been obvious to a skilled artisan at the time of invention to incorporate a super-continuum source in the transmitter of Arthurs' 167.

Regarding claim 41, Arthurs '167 teaches that the first optical signal wavelength comprises a packet comprising an identifier associated with a destination element external to the optical communication system (see fig. 3).

Regarding claim 43, Arthurs '167 teaches that at least some of the one or more transmitters comprise one or more light source that are selected from the group consisting of laser diodes and light emitting diodes (148 of fig. 9).

Regarding claim 47, Arthurs '167 teaches a look up table operable to facilitate generation of at least a first control signal based at least in part on an identifier (fig. 6; see also col. 10, lines 3-27).

Regarding claim 68, Arthurs '167 teaches that the optical signal separator comprises a filter (26 of fig. 9), and wherein the filter separates the first optical signal wavelength from the one or more optical signal wavelengths based at least in part on the control signal generated by the controller (control signal from track 31 of fig. 9).

Regarding claim 73, the combined invention of Arthurs '167 and Kurotori teaches the limitations of claim 36 but does not expressly disclose an optical amplifier to amplify the signal wavelengths. Examiner takes official notice that using an amplifier to amplify optical signals is well known in the art. It would have been obvious to a skilled artisan at the time of invention to include an optical amplifier in the system of Arthurs '167 in order to boost signal levels.

Regarding claim 74, Arthurs '167 teaches that the scheduling algorithm comprises a round robin scheduling algorithm (the scheduling algorithm 30 of fig. 10 is considered "round

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robin” in that it uses a token format traveling around the network; see also col. 5, line 43 to col. 6, line 7).

Regarding claim 83, the combined invention of Arthurs ‘167 and Kurotori does not expressly disclose that the optical amplifier is an erbium-doped fiber amplifier. However, examiner takes official notice that EDFAs are well known in the art. It would have been obvious to a skilled artisan at the time of invention to use an EDFA for amplification in order to decrease on costs.

Regarding claim 84, Kurotori teaches that the length of optical fiber comprises at least two stages and wherein a first stage comprises at least in part a standard optical fiber (see 4 of fig. 1).

Regarding claim 85, Kurotori teaches that the one or more modulators comprise a signal splitter followed by a plurality of modulators, wherein each of the plurality of modulators receives a different wavelength output from the super-continuum source (see fig. 1: note splitter 5 and modulators 6).

3. Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs et al. (US Patent No. 4,873,681; hereinafter “Arthurs ‘681”) in view of Kurotori et al. (US Patent No. 6,333,803 B1).

Regarding claim 36, Arthurs ‘681 teaches an optical communication system, comprising: a first integrated module (45-N of fig. 1) that generates a first output signal comprising a first optical signal wavelength (transmitter 45-N of fig. 1), the first integrated module coupled to an optical distribution network comprising one or more optical splitters (splitters in network 20 of

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fig. 1), at least some of a first one or more of the optical splitters receive the first output signal and separate the first output signal into a plurality of first output optical signals (star coupler 22 splits signal along trunks 26-1 to 26-N of fig. 1); a second integrated module (18-N of fig. 1) that generates a second output signal comprising a second optical signal wavelength (transmitter 67-N of fig. 1), the second integrated module and the second output signal coupled to the optical distribution network comprising the one or more optical splitters (coupled to network 20 of fig. 1), wherein the second integrated module receives at least one of the plurality of first output optical signals (via trunk 34-N) and wherein at least the second integrated module comprises: an optical signal separator operable to separate the first optical signal wavelength from one or more optical signal wavelengths received by the second integrated module (col. 5, lines 23-26); one or more receivers operable to receive the first optical signal wavelength and to convert at least a portion of the first optical signal wavelength into an electrical signal (receiver 61-N of fig. 1); and one or more transmitters each operable to generate the second output optical signal coupled directly to the optical distribution network at the second optical signal wavelength and to modulate information onto the second output optical signal (transmitter 67-N of fig. 1); and a controller coupled to the first and second integrated modules (40 of fig. 1; see also fig. 2), the controller operable to generate a control signal (47 of fig. 1) based at least in part on a scheduling algorithm (e.g., see figs. 5A and 5B) and to communicate the control signal to at least the first and second integrated modules (via fiber trunks), wherein the first and second integrated modules use the control signal to reduce contention within the optical communication system (see Abstract). Arthurs '681 does not expressly disclose that at least one of the transmitters is a super-continuum light source. Kurotori, from a similar field of endeavor, teaches an optical



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communication system (see fig. 14) wherein the transmitters have super-continuum sources comprising an optical fiber and a length of optical fiber followed by one or more modulators capable of modulating information on an output from the super-continuum source (see Fig. 1 and Abstract). A skilled artisan would have been motivated to incorporate a super-continuum source into at least one of the transmitters of Arthurs '681 in order to decrease wavelength deterioration and variations and to increase system functionality. It would have been obvious to a skilled artisan at the time of invention to incorporate a super-continuum source in the transmitter of Arthurs' 681.

4. Claims 69 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs '167 in view of Kurotori and in further view of Okayama et al. (US Patent No. 5,636,045).

Regarding claims 69 and 70, the combined invention of Arthurs '167 and Kurotori teaches the limitations of claim 36, but does not expressly disclose that the output signals are time division multiplexed. However, time division multiplexing is well known in the art. For example, Okayama discloses a packet switching system wherein signals are time division multiplexed by a star coupler (col. 1, lines 31-34). It would have been obvious to a skilled artisan at the time of invention to time division multiplex the signals in order to efficiently utilize bandwidth.

5. Claims 1, 7, 8, 11, 14, 49, 52, 55, and 75-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs '167 in view of Cheung et al. (US Patent No. 5,173,794) and in further view of Kurotori.

Regarding claims 1 and 78, Arthurs '167 teaches an optical communication device, comprising: a plurality of integrated modules operable to transmit and receive a plurality of optical signals (12-N and 22-N of fig. 10), at least one of the plurality of integrated modules comprising: one or more transmitters each operable to generate at least one of the plurality of optical signals (22-N of fig. 10) and to modulate information onto the at least one of the plurality of optical signals to form a modulated optical output signal (via 22 of fig. 8), each modulated optical output signal comprising at least a first optical signal wavelength (e.g.,  $\lambda_1$  of fig. 10); and one or more receivers each operable to receive an input optical signal (121 of fig. 8), each input optical signal comprising a second optical signal wavelength (along fiber 16 of fig. 8); a star coupler (20 of fig. 10) comprising an optical splitter (col. 4, lines 50-56), wherein the optical splitter comprises a power splitter that separates the multiple wavelength output optical signal (multiple wavelength signal  $\lambda_1$ - $\lambda_N$ ) into a plurality of multiple wavelength output optical signals (27-1 - 27-N of fig. 10), each of the plurality of output optical signals comprising a substantially similar set of wavelengths (col. 4, lines 50-56); and a controller coupled to at least some of the plurality of integrated modules (10" of fig. 10), the controller operable to generate a control signal (31, 131 of fig. 8) based at least in part on a scheduling algorithm (see col. 5, lines 42-51) and to communicate the control signal to the at least some of the plurality of integrated modules (transmission control 130, token buffer 124 of fig. 8), wherein the at least some of the plurality of integrated modules use the control signal to reduce contention between the plurality of integrated modules (see col. 5, lines 42-51; see also col. 10, lines 1-13). As stated above, Arthurs '167 discloses a star coupler (20 of fig. 10) comprising an optical splitter (col. 4, lines 50-56) to split a multiple wavelength signal into a substantially similar set of wavelengths (col.

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4, lines 50-56). Arthurs '167 does not expressly disclose that the star coupler comprises a wavelength division multiplexer (WDM). However, although Arthurs '167 does not include a comprehensive description of the star coupler, a skilled artisan would have clearly recognized that a WDM would usually reside in the star coupler 20 in order to combine the plurality of modulated output optical signals 24-N. This type of star coupler is common and widely used throughout the art. For example, Cheng, from a similar field of endeavor, teaches a wavelength division multiplexer (20 of fig. 3) coupled to at least some of a plurality of integrated modules (16 of fig. 3) and coupled to an optical splitter (50 of fig. 3), the wavelength division multiplexer operable to combine the modulated output optical signal and at least another of the plurality of optical signal wavelengths into a multiple wavelength output optical signal for communication to the optical splitter (WDM 20 combines channels 1-N for communication to splitter 50), wherein the optical splitter comprises a power splitter that separates the multiple wavelength output optical signal into a plurality of multiple wavelength output optical signals (splitter 50 splits the WDM signal into a plurality of signals 54), each of the plurality of output optical signals comprising a substantially similar set of wavelengths (see col. 5, lines 8-12). It would have been obvious to a skilled artisan at the time of invention to include a WDM, such as the one taught by Cheung, in the star coupler of Arthurs '167 in order to combine the output signals  $\lambda_1$ - $\lambda_N$  so as to properly split the multiple wavelength signal into a substantially similar set of wavelengths. Additionally, Arthurs '681 does not expressly disclose that at least one of the transmitters is a super-continuum light source. Kurotori, from a similar field of endeavor, teaches an optical communication system (see fig. 14) wherein the transmitters have super-continuum sources comprising an optical fiber and a length of optical fiber followed by one or more modulators

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capable of modulating information on an output from the super-continuum source (see Fig. 1 and Abstract). A skilled artisan would have been motivated to incorporate a super-continuum source into at least one of the transmitters of Arthurs '681 in order to decrease wavelength deterioration and variations and to increase system functionality. It would have been obvious to a skilled artisan at the time of invention to incorporate a super-continuum source in the transmitter of Arthurs' 681.

Regarding claim 7, the combined invention of Arthurs '167, Kurotori and Cheung teaches an optical signal separator operable to receive a multiple wavelength optical input signal (50 of fig. 3 of Cheung) and to separate that signal into at least the input optical signal (separates signal into a plurality of signals).

Regarding claim 8, Arthurs '167 teaches that at least one of the plurality of optical input signal wavelengths comprises a packet comprising an identifier associated with a element external to the optical communication device (see fig. 3).

Regarding claim 11, the combined invention of Arthurs '167, Kurotori and Cheung does not expressly disclose that the signal separator is an arrayed waveguide grating. However, examiner takes official notice that it is well known to use an arrayed waveguide grating to obtain a desired signal. It would have been obvious to a skilled artisan at the time of invention to use an arrayed waveguide grating in order to effectively retrieve the desired wavelength in a cost-efficient way.

Regarding claim 14, Arthurs '167 teaches that the transmitter includes at least one light source selected from the group consisting of laser diodes and light emitting diodes (22 of fig. 8).

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Regarding claim 49, Arthurs '167 teaches the limitations of claim 1 but does not expressly disclose a second optical amplifier to amplify the signal wavelengths. Examiner takes official notice that using an amplifier to amplify optical signals is well known in the art. It would have been obvious to a skilled artisan at the time of invention to include an optical amplifier in the system of Arthurs '167 in order to boost signal levels.

Regarding claim 52, Arthurs '167 teaches that the splitter separates the multiple wavelength output optical signal into sixteen or more outgoing signals (fig. 1: the signals can be split into a plurality of signals along fiber lines 27-1 to 27-N).

Regarding claim 55, Arthurs '167 teaches that the scheduling algorithm comprises a round robin scheduling algorithm (the scheduling algorithm 30 of fig. 10 is considered "round robin" in that it uses a token format traveling around the network; see also col. 5, line 43 to col. 6, line 7).

Regarding claim 75, the combined invention of Arthurs '167 and Kurotori does not expressly disclose that the optical amplifier is an erbium-doped fiber amplifier. However, examiner takes official notice that EDFAs are well known in the art. It would have been obvious to a skilled artisan at the time of invention to use an EDFA for amplification in order to decrease on costs.

Regarding claim 76, Kurotori teaches that the length of optical fiber comprises at least two stages and wherein a first stage comprises at least in part a standard optical fiber (see 4 of fig. 1).

Regarding claim 77, Kurotori teaches that the one or more modulators comprise a signal splitter followed by a plurality of modulators, wherein each of the plurality of modulators

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receives a different wavelength output from the super-continuum source (see fig. 1: note splitter 5 and modulators 6).

6. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs '167 in view of Kurotori and Cheung and in further view of Dantu et al. (US Patent No. 6,532,088).

Regarding claim 9, the combined invention of Arthurs '167, Kurotori and Cheung teaches the limitations of claim 8 but does not expressly disclose that the packet comprises an IP or TCP packet. However, the use of TCP in an optical packet switching system is well known and widely used in the art. For example, Dantu teaches an optical transmission system using packets comprising TCP/IP to transmit signals over a network (col. 1, line 66 - col. 2, line 8). A skilled artisan would have been motivated to implement TCP in a system for multiple reasons. With TCP, end-to-end virtual connections, which set parameters for transferring data without assigning physical network channels, are established between subscribers. With this type of operation, TCP is implemented in the end stations, but not seen by the network itself. This allocation of functions simplifies processing within the network and facilitates interfacing between heterogeneous networks. Furthermore, other advantages associated with TCP include the ability to have variable size packets, less operating systems interrupts, fast routing for data calls, and error control for efficient and accurate transmission. It would have been obvious to a skilled artisan at the time of invention to implement TCP in the system of Arthurs '167 in order to take advantage of the benefits above so as to improve overall system performance.

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7. Claims 50 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs '167 in view of Kurotori and Cheung and in further view of Okayama et al. (US Patent No. 5,636,045).

Regarding claims 50 and 51, Arthurs '167 teaches the limitations of claim 1, but does not expressly disclose that the signals are time division multiplexed. However, time division multiplexing is well known in the art. For example, Okayama discloses a packet switching system wherein signals are time division multiplexed by a star coupler (col. 1, lines 31-34). It would have been obvious to a skilled artisan at the time of invention to time division multiplex the signals in order to efficiently utilize bandwidth.

8. Claims 54 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs '167 in view of Kurotori and in further view of Labriola, II (US Patent No. 5,428,470).

Regarding claim 54, Arthurs '167 teaches the limitations of claim 1 including the limitation of a control network (30 of fig. 9). Arthurs '167 does not specifically disclose that the control network comprises an Ethernet network. However, Ethernet networks are well known in the art. For example, Labriola teaches a network system utilizing Ethernet links (col. 3, lines 44-47). One of ordinary skill in the art would have been motivated to use Ethernet links for coupling in order to provide high speed and efficient operation. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use Ethernet in the control network of Arthurs '167.

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9. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs '681 in view of Cheung and in further view of Kurotori.

Regarding claim 1, Arthurs '681 teaches an optical communication device, comprising: a plurality of integrated modules operable to transmit and receive a plurality of optical signals (16-N of fig. 1), at least one of the plurality of integrated modules comprising: one or more transmitters (45-N of fig. 1) each operable to generate at least one of the plurality of optical signals and to modulate information onto the at least one of the plurality of optical signals to form a modulated optical output signal (along 24-N of fig. 1), each modulated optical output signal comprising at least a first optical signal wavelength; and one or more receivers each operable to receive an input optical signal (51-N of fig. 1), each input optical signal comprising a second optical signal wavelength; a star coupler (22 of fig. 1) comprising an optical splitter (see col. 4, lines 13-15), operable to separate and distribute output optical signals (along fiber trunks 26-N), wherein each of the plurality of output optical signals comprising a substantially similar set of wavelengths (see col. 4, lines 13-15); and a controller coupled to at least some of the plurality of integrated modules (40 of fig. 1; see also fig. 2), the controller operable to generate a control signal (47 of fig. 1) based at least in part on a scheduling algorithm (e.g., see figs. 5A and 5B) and to communicate the control signal to the at least some of the plurality of integrated modules (along fiber trunks), wherein the at least some of the plurality of integrated modules use the control signal to reduce contention between the plurality of integrated modules (see Abstract). Arthurs '681 does not expressly disclose that the star coupler comprises a wavelength division multiplexer (WDM). However, although Arthurs '681 does not include a comprehensive description of the star coupler, a skilled artisan would have clearly recognized



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that a WDM would usually reside in the star coupler in order to combine the plurality of modulated output optical signals. This type of star coupler is common and widely used throughout the art. For example, Cheng, from a similar field of endeavor, teaches a wavelength division multiplexer (20 of fig. 3) coupled to at least some of a plurality of integrated modules (16 of fig. 3) and coupled to an optical splitter (50 of fig. 3), the wavelength division multiplexer operable to combine the modulated output optical signal and at least another of the plurality of optical signal wavelengths into a multiple wavelength output optical signal for communication to the optical splitter (WDM 20 combines channels 1-N for communication to splitter 50), wherein the optical splitter comprises a power splitter that separates the multiple wavelength output optical signal into a plurality of multiple wavelength output optical signals (splitter 50 splits the WDM signal into a plurality of signals 54), each of the plurality of output optical signals comprising a substantially similar set of wavelengths (see col. 5, lines 8-12). It would have been obvious to a skilled artisan at the time of invention to include a WDM, such as the one taught by Cheung, in the star coupler of Arthurs '681 in order to combine the output signals so as to properly split the multiple wavelength signal into a substantially similar set of wavelengths. Additionally, Arthurs '681 does not expressly disclose that at least one of the transmitters is a super-continuum light source. Kurotori, from a similar field of endeavor, teaches an optical communication system (see fig. 14) wherein the transmitters have super-continuum sources comprising an optical fiber and a length of optical fiber followed by one or more modulators capable of modulating information on an output from the super-continuum source (see Fig. 1 and Abstract). A skilled artisan would have been motivated to incorporate a super-continuum source into at least one of the transmitters of Arthurs '681 in order to decrease wavelength deterioration

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and variations and to increase system functionality. It would have been obvious to a skilled artisan at the time of invention to incorporate a super-continuum source in the transmitter of Arthurs' 681.

10. Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs '681 in view of Kurotori and Cheung and in further view of Arthurs '167.

Regarding claim 48, the combined invention of Arthurs '681, Kurotori and Cheung teaches the limitations of claim 1, but does not expressly disclose a filter to separate the input optical signal from a multiple wavelength signal received by the integrated module, wherein the filter separates the input optical signal based at least in part on the control signal generated by the controller. However, a skilled artisan would have recognized that some kind of signal separation or filtering function would have been needed since the transport star coupler (32 of fig. 1) distributes a multiple wavelength signal to the integrated module (12-N of fig. 1). It is well known in the art to detect a specific wavelength from a multiple wavelength signal using a signal separator or filter. For example, Arthurs '167, from a similar field of endeavor, discloses an integrated module receiving a multiple wavelength signal (27 of fig. 9) and using a filter to separate the input optical signal from the multiple wavelength signal (26 of fig. 9). The filter separates the input optical signal based at least in part on the control signal generated by the controller (28 of fig. 9). It would have been obvious to a skilled artisan at the time of invention to incorporate the filter of Arthurs '167 in the system of Arthurs '681 in order to receive the desired wavelength.

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11. Claims 18, 24, 27, 35, 56, 58, 61, 64-66, and 79-82 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs '681 in view of Arthurs '167 and in further view of Kurotori.

Regarding claims 18, 56, and 82 Arthurs '681 teaches an optical communication device, comprising: a plurality of integrated modules (16-N of fig. 1) operable to communicate a multiple wavelength output signal, each of the plurality of integrated modules operable to receive at least some of a plurality of optical signal wavelengths (36-N of fig. 1) and to generate at least one wavelength of a multiple wavelength output optical signal (transmitted along 24-N of fig. 1), each of the plurality of integrated modules comprising: a receiver operable to receive an input optical signal from the plurality of optical signal wavelengths and to convert at least a portion of the input optical signal into an electronic signal (51-N of fig. 1); and an optical transmitter (45-N of fig. 1) operable to generate at least a portion of the multiple wavelength output optical signal and to modulate information onto the portion of the multiple wavelength optical signal to form a modulated optical output signal (transmitted along 24-N of fig. 1); an optical splitter coupled to at least some of the plurality of integrated modules (20 of fig. 1; see col. 4, lines 13-15), wherein the optical splitter is operable to receive at least some of the multiple wavelength output optical signal and to separate the multiple wavelength output optical signal into a plurality of multiple wavelength output optical signals (transmitted along fiber trunks 26-N of fig. 1); and a controller coupled to at least some of the plurality of integrated modules (40 of fig. 1), the controller operable to generate a control signal (47 of fig. 1) based at least in part on a scheduling algorithm (e.g., see figs. 5A and 5N) and to communicate the control signal to the at least some of the plurality of integrated modules (along fiber trunks), wherein the at least some of the plurality of integrated modules use the control signal to reduce contention between the plurality of integrated

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modules (see Abstract). Arthurs '681 does not expressly disclose an optical signal separator operable to separate the input optical signal from the plurality of optical signal wavelengths. However, a skilled artisan would have recognized that some kind of signal separation or filtering function would have been needed since the transport star coupler (32 of fig. 1) distributes a multiple wavelength signal to the integrated module (12-N of fig. 1). It is well known in the art to detect a specific wavelength from a multiple wavelength signal using a signal separator or filter. For example, Arthurs '167, from a similar field of endeavor, discloses an integrated module receiving a multiple wavelength signal (27 of fig. 9) and using a filter to separate the input optical signal from the multiple wavelength signal (26 of fig. 9). The filter separates the input optical signal based at least in part on the control signal generated by the controller (28 of fig. 9). It would have been obvious to a skilled artisan at the time of invention to incorporate the filter of Arthurs '167 in the system of Arthurs '681 in order to receive the desired wavelength. Additionally, Arthurs '681 does not expressly disclose that at least one of the transmitters is a super-continuum light source. Kurotori, from a similar field of endeavor, teaches an optical communication system (see fig. 14) wherein the transmitters have super-continuum sources comprising an optical fiber and a length of optical fiber followed by one or more modulators capable of modulating information on an output from the super-continuum source (see Fig. 1 and Abstract). A skilled artisan would have been motivated to incorporate a super-continuum source into at least one of the transmitters of Arthurs '681 in order to decrease wavelength deterioration and variations and to increase system functionality. It would have been obvious to a skilled artisan at the time of invention to incorporate a super-continuum source in the transmitter of Arthurs' 681.

Regarding claim 24, Arthurs '681 teaches that the signal wavelengths comprises a packet comprising an identifier associated with a destination element external to the optical communication system (see col. 1, lines 50-55).

Regarding claim 27, the combined invention of Arthurs '681 and Arthurs '167 teaches the limitations of claim 18 but does not specifically disclose that the separator is a device selected from the group consisting of a wavelength division demultiplexer, a waveguide grating router, and an arrayed waveguide grating. However, examiner takes official notice that it is well known to use an arrayed waveguide grating to obtain a desired signal. It would have been obvious to a skilled artisan at the time of invention to use an arrayed waveguide grating in order to effectively retrieve the desired wavelength in a cost-efficient way.

Regarding claim 35, Arthurs '681 teaches a combiner operable to receive each of the optical output wavelength signals and to generate the at least one wavelength of the multiple wavelength output optical signal (star coupler 22 of fig. 1 combines the signals along fiber trunks 24-N).

Regarding claim 58, Arthurs '681 teaches the limitations of claim 36 but does not expressly disclose a second optical amplifier to amplify the signal wavelengths. Examiner takes official notice that using an amplifier to amplify optical signals is well known in the art. It would have been obvious to a skilled artisan at the time of invention to include an optical amplifier in the system of Arthurs '681 in order to boost signal levels.

Regarding claim 61, Arthurs '681 teaches that the splitter separates the multiple wavelength output optical signal into sixteen or more outgoing signals (fig. 1: the signals can be split into a plurality of signals along fiber lines 26-1 to 26-N).

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Regarding claim 64, Arthurs '681 teaches that the scheduling algorithm comprises a round robin scheduling algorithm (the scheduling algorithm used by the controller is considered to be "round robin"; see also fig. 2).

Regarding claim 65, Arthurs '681 discloses the limitations of claim 18, but does not disclose that the integrated module comprises a plurality of optical receivers. Instead, Arthurs '681 uses a single tunable optical receiver to receive signals at multiple desired wavelengths. However, official notice is taken that it is well known to use a plurality of optical receivers to receive signals at multiple desired wavelengths. A skilled artisan would have been motivated to use a plurality of optical receivers instead of a single tunable receiver in order to have a simpler system for easier maintenance. It would have been obvious to a skilled artisan at the time of invention to use a plurality of optical receivers in order to receive signals at multiple desired wavelengths.

Regarding claim 66, the combined invention of Arthurs '681, Kurotori, and Arthurs '167 teaches the limitations of claim 35 but does not expressly disclose that the combiner is a power combiner. However, examiner takes official notice that power combiners are well known in the art. It would have been obvious to a skilled artisan at the time of invention to use a power combiner in order to efficiently combine signals for proper distribution.

Regarding claim 79, the combined invention of Arthurs '167 and Kurotori does not expressly disclose that the optical amplifier is an erbium-doped fiber amplifier. However, examiner takes official notice that EDFAs are well known in the art. It would have been obvious to a skilled artisan at the time of invention to use an EDFA for amplification in order to decrease on costs.

Regarding claim 80, Kurotori teaches that the length of optical fiber comprises at least two stages and wherein a first stage comprises at least in part a standard optical fiber (see 4 of fig. 1).

Regarding claim 81, Kurotori teaches that the one or more modulators comprise a signal splitter followed by a plurality of modulators, wherein each of the plurality of modulators receives a different wavelength output from the super-continuum source (see fig. 1: note splitter 5 and modulators 6).

12. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs '681 in view of Arthurs '167 and Kurotori and in further view of Dantu et al. (US Patent No. 6,532,088).

Regarding claim 25, the combined invention of Arthurs '681, Kurotori and Arthurs '167 teaches the limitations of claim 24 but does not expressly disclose that the packet comprises an IP or TCP packet. However, the use of the use of TCP in an optical packet switching system is well known and widely used in the art. For example, Dantu teaches an optical transmission system using packets comprising TCP/IP to transmit signals over a network (col. 1, line 66 - col. 2, line 8). A skilled artisan would have been motivated to implement TCP in a system for multiple reasons. With TCP, end-to-end virtual connections, which set parameters for transferring data without assigning physical network channels, are established between subscribers. With this type of operation, TCP is implemented in the end stations, but not seen by the network itself. This allocation of functions simplifies processing within the network and facilitates interfacing between heterogeneous networks. Furthermore, other advantages associated with TCP include the ability to have variable size packets, less operating systems

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interrupts, fast routing for data calls, and error control for efficient and accurate transmission. It would have been obvious to a skilled artisan at the time of invention to implement TCP in the system of Arthurs '681 in order to take advantage of the benefits above so as to improve overall system performance.

13. Claims 59 and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs '681 in view of Arthurs '167 and Kurotori and in further view of Okayama et al. (US Patent No. 5,636,045).

Regarding claims 59 and 60, the combined invention of Arthurs '681, Kurotori and Arthurs '167 teaches the limitations of claim 18, but does not expressly disclose that the signals are time division multiplexed. However, time division multiplexing is well known in the art. For example, Okayama discloses a packet switching system wherein signals are time division multiplexed by a star coupler (col. 1, lines 31-34). It would have been obvious to a skilled artisan at the time of invention to time division multiplex the signals in order to efficiently utilize bandwidth.

14. Claims 63 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs '681 in view of Arthurs '167 and Kurotori and in further view of Labriola, II (US Patent No. 5,428,470).

Regarding claim 63, the combined invention of Arthurs '681, Kurotori and Arthurs '167 teaches the limitations of claim 18 including the limitation of a control network (30 of fig. 9). Arthurs '681 does not specifically disclose that the control network comprises an Ethernet network. However, Ethernet networks are well known in the art. For example, Labriola teaches



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a network system utilizing Ethernet links (col. 3, lines 44-47). One of ordinary skill in the art would have been motivated to use Ethernet links for coupling in order to provide high speed and efficient operation. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use Ethernet in the control network of Arthurs '681.

***Response to Arguments***

15. Applicant's arguments with respect to the claims have been considered but are moot in view of the new grounds of rejection.

Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Lee whose telephone number is (571) 272-2220. The examiner can normally be reached on Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



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